Citation:

Milton JE, Briche B, Brown IJ, Hickson M, Robertson CE, Frost GS. Relationship of glycaemic index with cardiovascular risk factors: Analysis of the National Diet and Nutrition Survey for people aged 65 and older. *Public Health Nutr.* 2007 Nov; 10(11): 1,321-1,335.

PubMed ID: 17456246

Study Design:

Cross-Sectional Study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine if low dietary glycemic index is associated with lower body weight, body mass index (BMI), waist-hip ratio, blood pressure and a more favorable serum cholesterol profile in adults aged 65 years and older.

Inclusion Criteria:

Free-living, non-institutionalized individuals aged 65 years and older who agreed to be interviewed.

Exclusion Criteria:

Participants who reported being unwell during the dietary recording period.

Description of Study Protocol:

Recruitment

National Diet and Nutrition Survey methods are described in previous publications.

Design

Cross-sectional study.

Dietary Intake/Dietary Assessment Methodology

- Subjects were provided with digital food scales and two four-day dietary record sheets (one for use at home and a simplified form for use outside the home) to record intake. Weekday vs. weekend variation was accounted for

- Basal metabolic rate (estimated based on age, sex and weight) was compared with energy intake to identify underreporting and used to identify low energy reporters.

Statistical Analysis

- All nutrient data are presented as energy-adjusted variables to control for the potential confounding effect of energy intake
- Differences in means between low energy reporters and non-low energy reporters was compared with T-tests and chi-square tests
- A Spearman correlation matrix for nutrient and physical activity was constructed to identify potential collinearity
- Associations of glycemic index with cardiovascular risk factors were analyzed with multiple linear regression. Analyses were also conducted stratified by sex.

Data Collection Summary:

Timing of Measurements

A descriptive interview detailing general eating habits, medications, socioeconomic and health status was completed before subjects were invited to participate in an optional subsequent interviews, which included anthropometric measurements (carried out in the subject's home) and two four-day dietary records for use at home and outside the home.

Dependent Variables

Body weight, BMI, waist-hip ratio, blood pressure, serum cholesterol (total cholesterol, HDL-cholesterol, LDL-cholesterol, triacylglycerol concentrations).

Independent Variables

Glycemic index.

Control Variables

- Age
- Region
- Social class (manual or non-manual occupation prior to retirement).

Description of Actual Data Sample:

- *Initial N:* 1,632 (provided full or partial interview)
- *Attrition (final N):* 1,152 (provided dietary intake record and were well during the recording period)
- *Mean age:* (SD)
    - Males 75.9 (7.0) years
    - Females 77.6 (8.0) years
- *Anthropometrics:* Mean (SD) BMI:
    - Males 26.3 (3.6) kg/m^2
    - Females 26.6 (4.8) kg/m^2
- *Location:* United Kingdom (1994 to 1995).

Summary of Results:

Results of Linear Regression of Glycemic Index and Cardiovascular Risk Factors in Males and Females

Variables	Males Beta Coefficient (standard error)	P-value for Males	Females Beta Coefficient (standard error)	P-value for Females
Weight[a]	-0.054 (0.157)	0.73	-0.089 (0.167)	0.60
BMI[a]	-0.005 (0.049)	0.92	-0.005 (0.068)	0.94
Waist-hip ratio[a]	0.001 (0.001)	0.30	0.000 (0.001)	0.94
Total cholesterol[b]	-0.008 (0.017)	0.63	0.009 (0.026)	0.73
LDL-cholesterol[b]	-0.009 (0.018)	0.60	0.009 (0.026)	0.73
HDL-cholesterol[c]	-0.001 (0.002)	0.57	0.002 (0.002)	0.42
Triacylglycerol[d]	0.003 (0.003)	0.35	0.001 (0.003)	0.86
Systolic blood pressure[e]	0.073 (0.306)	0.81	0.159 (0.361)	0.66
Diastolic blood pressure[e]	0.026 (0.177)	0.88	-0.122 (0.207)	0.56

[a] Adjusted for age, social class, region, physical activity, energy intake, fat intake and Englyst fiber intake.

[b] Adjusted for age, social class, region, physical activity, energy intake, BMI, fat intake, smoking, polyunsaturated fat/saturated fat ratio, cholesterol intake, trans fatty acids intake and Englyst fiber intake.

[c] Adjusted for age, social class, region, physical activity, energy intake, BMI, fat intake, polyunsaturated/saturated fat ratio, alcohol intake, smoking, cholesterol intake, monounsaturated fats intake and Englyst fiber intake.

[d] Adjusted for age, social class, region, physical activity, energy intake, BMI, alcohol intake, carbohydrate intake and Englyst fiber intake.

[e] Adjusted for age, social class, region, physical activity, energy intake, BMI, alcohol intake, smoking, polyunsaturated/saturated fat ratio, cholesterol intake and Englyst fiber intake.

Other Findings

- The exclusion of low energy responders did not materially affect the outcomes, and thus analyses were presented on the full dataset
- Dietary glycemic index did not correlate significantly with weight, BMI, waist-hip ratio, blood pressure or any lipoprotein fraction in either sex. Dietary glycemic index was inversely associated with Englyst fiber intakes in males (R=-0.34) and females (R=-0.32)
- When the interactions between fiber and glycemic index were considered, it was apparent that in females, the NS associations between dietary glycemic index and weight and between dietary glycemic index and BMI were dependent on fiber intake. For females, the addition of

a fiber times glycemic index interaction term to the regression model revealed significant inverse associations between glycemic index and weight (beta = -0.995, SE: 0.360, P=0.008) and glycemic index and BMI (beta = -0.302, SE: 0.145, P=0.038).

Author Conclusion:

Study results provide limited evidence for a beneficial effect of low-glycemic index diets with regard to body weight, BMI or cardiovascular risk factors in an older British population.

Reviewer Comments:

Author-identified limitations:

- *Study results may be confounded by pre-existing cardiovascular disease (58% taking cardiovascular medications) or diabetes (15% taking endocrine medications)*
- *Regression analyses may be underpowered and subject to attenuation of dietary glycemic index-cardiovascular risk factor associations as a result of regression dilution bias from unreliable dietary glycemic index estimates*
- *The four-day dietary record may not represent long-term habitual intake*
- *The survey had a low response rate of about 50%, resulting in a sample size half that estimated to observe significant associations, and one potentially biased by differences in diet, lifestyle and cardiovascular risk factors between responders and non-responders.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes

1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	No
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A

5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes

	7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
	7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**		Yes
	8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
	8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	No
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes